Remarks

Reconsideration of pending Claims 1-57 and 73-121 is respectfully requested.

Claims 1, 5-9, 16-20, 23, 25-28, 36-39, 41-47, 49, 51-53, 73, 75-76, 80-83, 85-92, and 97 have been amended. Support for the amendments is in the original claims as filed, in the specification at page 4, lines 14-15, and page 6, lines 21-22, and the drawings (i.e., Fig. 2, silicon layer 18).

No new matter has been added with the amendments to the claims, which are intended to merely clarify language used in the claims and/or the subject matter claimed. The scope of the claims is intended to be the same as before the amendment.

Rejection of Claims under 35 U.S.C. § 102(b) (Muralidhar)

The Examiner rejected Claims 1-14, 16-19, 97-100, 103-104, 106, and 112 under Section 102(e) as anticipated by USP 6,297,095 (Muralidhar). The Examiner rejected Claims 20-21 and 105 under Section 103(a) as obvious over Muralidhar. These rejections are respectfully traversed.

The Examiner cites Muralidhar as disclosing all of the elements of the claims, and cites particularly to FIGS. 6-10 and 21-25, col. 10, lines 25-65, and col. 16, lines 19-36. The Examiner also cites to col. 12, lines 50-55, as disclosing a silicon layer thickness of 30 angstroms. As for Claims 20-21 and 105, the Examiner maintains that it would be obvious to select a flow rate and exposing time to nitridize the silicon layer.

Muralidhar does not teach or suggest Applicant's methods of forming a nitride barrier layer by depositing a *continuous* layer of silicon on a dielectric layer, and exposing the silicon layer to a nitrogen gas to form a silicon nitride barrier layer whereby *combined thickness* of the silicon layer and silicon nitride layer is about *10-30 angstroms*.

Muralidhar discloses forming silicon nanoclusters 104, which are *physically isolated* from each other, on a tunnel dielectric material layer 102. Muralidhar further discloses forming a nitride layer 106, 107 over the nanoclusters 104. Muralidhar teaches that the size of the nanoclusters is *between 30-70 angstroms*, and the thickness of the nitride layer is *5 angstroms*.

See FIGS. 23 and 25 below, and col. 2 at lines 5-14, col. 12 at lines 50-53, col. 16 at lines 45-48, and col. 17 at lines 13-23 (emphasis added):

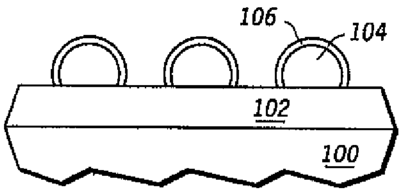

FIG.23

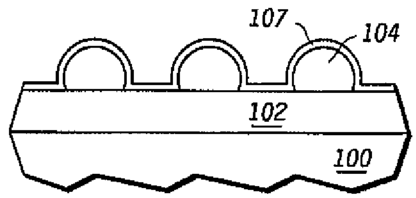

FIG.25

> In order to reduce the required thickness of the tunnel dielectric and improve the area efficiency of the memory structures by reducing the need for charge pumps, the uniform layer of material used for the floating gate may be replaced with a plurality of nanoclusters, which operate as *isolated* charge storage elements. Such nanoclusters are also often referred to as nanocrystals, as they may be formed of silicon crystals. In combination, the plurality of nanoclusters provide adequate charge storage capacity *while remaining physically isolated from each other* ...
>
> ...
>
> A desirable size of nanoclusters for use in semiconductor memory structures may be *between 30 and 70 angstroms*, and in some embodiments a target diameter of 50 angstroms may be appropriate. ...
>
> ...
>
> Preferably, the formation of the encapsulation layer **106** can be controlled such that the *thickness of the encapsulation layer **106** is on the order of 5 angstroms*, or no greater than 10% of the diameter of the nanoclusters **104**. ...
>
> ...
>
> In other embodiments, a protecting nitride layer may be deposited rather than grown on individual nanoclusters. **FIG. 25** illustrates the nanocluster structures as shown in FIG. 22 following a step where a thin nitride layer **107** is deposited. ...*A desirable thickness for the thin nitride layer **107** may be on the order of 5 angstroms*. ...

Muralidhar does not teach or suggest Applicant's methods as claimed. Accordingly, withdrawal of the rejections based on Muralidhar is respectfully requested.

Prior Art of Record/Not Relied Upon (Aronowitz)

The prior art made of record and not relied upon is acknowledged. At page 9, the Examiner stated as follows:

> Aronowitz et al. (US 6,087,229) anticipate at least claims 1, 5-8, 18, 73-74, 81-82, 97-99, 103, and 106.

The Examiner has apparently made a rejection of the claims without stating the basis for the rejection. Applicant respectfully traverses, and requests the Examiner to state on the record, the basis, if any, for rejection of the claims based on Aronowitz.

Aronowitz teaches a method for forming an *oxynitride* barrier layer — not a silicon nitride barrier layer as disclosed and claimed by Applicant.

Aronowitz teaches depositing a silicon layer on a gate oxide layer on a silicon substrate, followed by plasma nitridization *and subsequent oxidation of the nitridized silicon layer* to form an *oxynitride* layer.

Aronowitz particularly teaches oxidizing the nitridized silicon layer in order to "harden" the gate oxide layer and form an effective barrier to prevent boron diffusion from a gate electrode through a gate oxide into a silicon substrate. See Aronowitz at cols. 1-2, bridging paragraph (emphasis added):

> *Gate oxide hardening is required* for at least three reasons. ...Finally, hardened gate oxides may also be effective in *preventing diffusion of dopant atoms* from the gate electrode through the gate oxide into the substrate. One particularly troubling problem is *boron diffusion* from a polysilicon gate electrode, through the gate oxide and into the silicon substrate. Boron is mobile at typical processing temperatures. Unwanted dopant diffusion into the substrate will cause fluctuations in the semiconductor device's threshold voltage. This is particularly important in PMOS devices where boron dopant is commonly used in the polysilicon gate electrode.

Aronowitz teaches a method of forming a barrier against boron diffusion by nitridizing a bilayer of an oxide layer and a silicon layer, *and then oxidizing* the bilayer to form an oxynitride layer.

For the foregoing reasons, Aronowitz does not anticipate the claims.

Extension of Term. The proceedings herein are for a patent application and the provisions of 37 CFR § 1.136 apply. Applicant believes that a one-month extension of term is required. Please charge the required fee to Account No. 23-2053. If an additional extension is required, please consider this a petition therefor, and charge the required fee to Account No. 23-2053.

It is respectfully submitted that the claims are in condition for allowance and notification to that effect is earnestly solicited.

Respectfully submitted,

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